Claims:

1. A method of optically converting a digital signal to an analog signal, by employing a conversion module, comprising the steps of:

receiving a predetermined optical signal;

splitting the received optical signal into a plurality of mutually coherent optical beams;

supplying said plurality of optical beams on a one-to-one basis to a corresponding plurality of optical phase shifters;

supplying bits of a digital data sequence to said plurality of optical phase shifters for controlling the phase shift of the optical beams supplied to the individual ones of said plurality of phase shifters;

supplying said phase shifted optical beams to a combiner for recombining mutually coherent phase shifted optical beams; and

said combined mutually coherent phase shifted optical beams representing an optically converted digital-to-analog optical signal.

2. The method as defined in claim 1 wherein said plurality of optical phase shifters includes at least two (2) optical phase shifters.

3. The method as defined in claim 1 wherein said plurality of optical phase shifters includes at least four (4) optical phase shifters.

4. The method as defined in claim 1 wherein said plurality of optical phase shifters includes at least eight (8) optical phase shifters.

5. The method as defined in claim 2 further including a step of generating a laser optical signal.

6. The method as defined in claim 5 wherein said step of generating said laser optical signal includes generating a continuous wave optical signal.

7. The method as defined in claim 5 wherein said step of generating said laser optical signal includes generating a pulsed optical signal.

8. The method as defined in claim 6 further including a photodiode for detecting said recombined optical signal representing said optically converted digital-to-analog optical signal.

9. The method as defined in claims 8 wherein in response to said recombined mutually coherent optical signals said photodiode developes current i_{PD} as follows:

$$i_{PD} = RP_m \left| \sum_i \exp\left(j\pi \frac{V_i}{V_\pi} \right) \right|^2,$$

where i_{PD} is the photodiode current, R is the responsivity of the photodiode, P_{in} is he launched optical power, V_i is the control voltage for the *i-th* optical phase shift modulator developed in response to said bits of said digital data sequence and V_π is the switching voltage for an optical phase shift modulator.

10. The method as defined in claim 9 further including configuring each of said control voltages V_i so that each has two voltage levels, $V_{i,low}$ and $V_{i,hi}$, thereby generating 2^i output current i_{PD} levels.

11. The method as defined in claim 10 further including switching said control voltage levels at a predetermined rate for generating an arbitrary waveform at an output of said photodiode.

12. The method as defined in claim 7 further including controlling said pulsed laser optical signal to have the same repetition rate as bits being supplied from a memory unit to control the phase shift of each of said optical phase shifters.

13. The method as defined in claim 12 further including a photodiode for detecting said recombined optical signal representing said optically converted digital-to-analog optical signal, and wherein in response to said recombined mutually coherent optical signals said photodiode developes current i_{PD} as follows:

$$i_{PD} = RP_m \left| \sum_i \exp\left(j\pi \frac{V_i}{V_\pi} \right) \right|^2,$$

where i_{PD} is the photodiode current, R is the responsivity of the photodiode, P_{in} is he launched optical power, V_i is the control voltage for the *i-th* optical phase shift modulator developed in response to said bits of said digital data sequence and V_π is the switching voltage for an optical phase shift modulator.

14. The method as defined in claim 13 further including configuring each of said control voltages V_i so that each has two voltage levels, $V_{i,low}$ and $V_{i,hi}$, thereby generating 2^i output current i_{PD} levels.

15. The method as defined in claim 14 further including switching said control voltage levels at a predetermined rate for generating an arbitrary waveform at an output of said photodiode.

16. The method as defined in claim 6 further including cascading a plurality of said conversion modules each including a predetermined plurality of optical phase shifters for generating said converted digital-to-analog optical signal.

17. The method as defined in claim 16 further including a photodiode for detecting said optically converted digital-to-analog optical signal.

18. The method as defined in claims 17 wherein in response to said recombined mutually coherent optical signals said photodiode developes current i_{PD} as follows:

$$i_{PD} = RP_{in}\prod_{j}\left|\sum_{i}\exp\left(j\pi\frac{V_{i,j}}{V_{\pi}}\right)\right|^{2},$$

where j is the running index for the j-th stage, i_{PD} is the photodiode current, R is the responsivity of the photodiode, P_{in} is he launched optical power, V_{ij} is the control voltage for the *i-th* optical phase shift modulator in the j-th stage developed in response to said bits of said digital data sequence and V_{π} is the switching voltage for an optical phase shift modulator.

19. The method as defined in claim 18 further including configuring each of said control voltages V_{ij} so that each has two voltage levels, $V_{ij,low}$ and $V_{ij,hi}$, thereby generating 2^{ij} output current i_{PD} levels.

20. The method as defined in claim 19 further including switching said control voltage levels at a predetermined rate for generating an arbitrary waveform at an output of said photodiode.

15. The method as defined in claim 14 further including switching said control voltage levels at a predetermined rate for generating an arbitrary waveform at an output of said photodiode.

16. The method as defined in claim 6 further including cascading a plurality of said conversion modules each including a predetermined plurality of optical phase shifters for generating said converted digital-to-analog optical signal.

17. The method as defined in claim 16 further including a photodiode for detecting said optically converted digital-to-analog optical signal.

18. The method as defined in claims 17 wherein in response to said recombined mutually coherent optical signals said photodiode developes current i_{PD} as follows:

$$i_{PD} = RP_{in}\prod_{j}\left|\sum_{i}\exp\left(j\pi\frac{V_{i,j}}{V_{\pi}}\right)\right|^{2},$$

where j is the running index for the j-th stage, i_{PD} is the photodiode current, R is the responsivity of the photodiode, P_{in} is he launched optical power, V_{ij} is the control voltage for the *i-th* optical phase shift modulator in the j-th stage developed in response to said bits of said digital data sequence and V_{π} is the switching voltage for an optical phase shift modulator.

19. The method as defined in claim 18 further including configuring each of said control voltages V_{ij} so that each has two voltage levels, $V_{ij,low}$ and $V_{ij,hi}$, thereby generating 2^{ij} output current i_{PD} levels.

20. The method as defined in claim 19 further including switching said control voltage levels at a predetermined rate for generating an arbitrary waveform at an output of said photodiode.